Mortality of doctors in different specialties: findings from a cohort of 20 000 NHS hospital consultants

Lucy M Carpenter, Anthony J Swerdlow, Nicola T Fear

Abstract

***Objectives*—To examine patterns of cause specific mortality in NHS hospital consultants according to their specialty and to assess these in the context of potential occupational exposures.**

***Methods*—A historical cohort assembled from Department of Health records with follow up through the NHS Central Register involving 18 358 male and 2168 female NHS hospital consultants employed in England and Wales between 1962 and 1979. Main outcome measures examined were cause specific mortality during 1962-92 in all consultants combined, and separately for 17 specialty groups, with age, sex, and calendar year adjusted standardised mortality ratios (SMRs) for comparison with national rates, and rate ratios (RRs) for comparison with rates in all consultants combined.**

***Results*—The 2798 deaths at ages 25 to 74 reported during the 30 year study period were less than half the number expected on the basis of national rates (SMR 48, 95% confidence interval (95% CI) 46 to 49). Low mortality was evident for cardiovascular disease, lung cancer, other diseases related to smoking, and particularly for diabetes (SMR 14, 95% CI 6 to 29). Death rates from accidental poisoning were significantly raised among male consultants (SMR 227, 95% CI 135 to 359), the excess being most apparent in obstetricians and gynaecologists (SMR 934); almost all deaths from accidental poisoning involved prescription drugs. A significantly raised death rate from injury and poisoning among female consultants was due largely to a twofold excess of suicide (SMR 215, 95% CI 93 to 423), the rate for this cause being significantly raised in anaesthetists (SMR 405). Compared with all consultants, significantly raised mortality was found in psychiatrists for all causes combined (RR 1.12), ischaemic heart disease (RR 1.18), and injury and poisoning (RR 1.46); in anaesthetists for cirrhosis (RR 2.22); and in radiologists and radiotherapists for respiratory disease (RR 1.68). There were significant excesses of colon cancer in psychiatrists (RR 1.67, compared with all consultants) and ear, nose, and throat surgeons (RR 2.25); melanoma in anaesthetists (RR 3.33); bladder cancer in general surgeons (RR 2.40); and laryngeal cancer in ophthalmologists (RR 7.63).**

***Conclusions*—Lower rates of smoking will have contributed substantially to the low overall death rates found in consultants, but other beneficial health related behaviours, and better access to health care, may have also played a part. The increased risks of accidental poisoning in male consultants, and of suicide in female consultants are of concern, and better preventive measures are needed. The few significant excesses of specific cancers found in certain specialties have no obvious explanation other than chance. A significant excess mortality from cirrhosis in anaesthetists might reflect an occupational hazard and may warrant further investigation.**

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Department of Public Health and Primary Care, University of Oxford
L M Carpenter

Cancer Epidemiology Unit, Imperial Cancer Research Fund, Gibson Building, Radcliffe Infirmary, Woodstock Road, Oxford OX2 6HE
N T Fear

Epidemiological Monitoring Unit, Department of Epidemiology and Population Sciences, London School of Hygiene and Tropical Medicine, Keppel Street, London WC1E 7HT
A J Swerdlow

Correspondence to:
Dr Lucy M Carpenter, Department of Public Health and Primary Care, University of Oxford, Gibson Building, Radcliffe Infirmary, Woodstock Road, Oxford OX2 6HE.

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Members of the medical profession in many industrialised countries experience lower overall death rates than the general population.[1-5] This is thought to reflect the combined effects of their relatively privileged socioeconomic status and knowledge of the consequences of health related behaviours, such as smoking.[6] There are, however, several aspects of medical work that may be hazardous to the health of doctors. Concern has often been expressed about the long hours of stressful work which typify employment in the medical profession, particularly among junior doctors.[7] The twofold death rates from suicide and accidental poisoning among medical practitioners reported in recent national statistics for England and Wales[1] might be due to these stresses. Also, doctors may be exposed to several specific hazards, including biological and infective agents, anaesthetic gases, toxic chemicals, and ionising radiation.[6] The increased risk of leukaemia found among radiologists working in the early part of this century is one well documented instance of the adverse effects of such occupational exposures.[8] Other examples are the possibly carcinogenic and hepatotoxic effects of inhaled anaesthetic gases,[9,10] and a raised risk of brain cancer described in pathologists,[11] although the evidence for these and other associations is limited.

Table 1 Vital status at 30 June 1992 of all NHS consultants employed between 1962 and 1979

	Men	*Women*	*Total*	*(%)*
Included in study population	18358	2168	20526	(98)
Dead	4058	277	4335	(21)
Emigrated	681	59	740	(4)
Alive	13619	1832	15451	(74)
Excluded from study population	371	95	466	(2)
Untraced or insufficient information for tracing	314	89	403	(2)
Emigrated before entry to study	57	6	63	(< 1)
Total number	18729	2263	20992	(100)
Person-years at risk	384699	43071	427770	

In the early 1970s, concerns about possible excessive mortality among anaesthetists prompted the Department of Health and Social Security, in collaboration with the Office of Population Censuses and Surveys, to set up a cohort study of NHS consultants. Several studies have described death rates in those incertain medical specialties including radiologists,[8 12] pathologists,[11 12] psychiatrists,[13] dentists,[14] and anaesthetists.[15 16] Most of these have involved comparisons with national death rates, few have compared death rates across a range of different medical specialties, and most have not included women. The study of Doll and Peto[17] described mortality according to specialty in a large cohort of male British doctors born before 1915 who replied to a questionnaire on their smoking habits. The present study examines mortality in over 20 000 male and female NHS consultants, 76% of whom were born after 1915, with the objective of comparing patterns of mortality in different specialties during the 30 year period 1962-92.

Subjects and methods

Annual statistics of medical manpower in the NHS have been kept by the Department of Health for many years[18] and since 1962 staff records have been stored in computer readable form. To simplify the identification of medical professionals working in specific specialties, the present study was confined to NHS consultants employed in England and Wales.[18 19] A list of all consultants whose names appeared on annual lists of NHS employees from 1962 to 1979 was supplied to the Office of Population Censuses and Surveys. This included, for each consultant, full name, sex, date of birth, specialty, and year of first employment by the NHS.

Identifying details for each consultant were sent to the NHS central register for tracing, from which details were extracted of all deaths and emigrations in traced consultants and copies of death certificates were provided. Where duplicate records were found for individual consultants, the record corresponding to the first year of employment was used. Deaths were coded to the international classification of diseases (ICD) using the revision in force at the time of death and bridge coded to its 9th revision (ICD-9) for the analyses.[20]

Fifty one different specialty codes were provided in the manpower files used for the study. These were aggregated to form 17 specialty groups for the analyses (see appendix). Person-years at risk were calculated from 30 September of the year in which each consultant first appeared on the Department of Health computer file to their date of death, emigration, or 30 June 1992, whichever was earliest. Person-years and deaths were stratified by five-year age group, sex, single calendar year, and specialty.

Mortality rates were assessed in two main ways. Firstly, for comparisons with national rates, the numbers of deaths observed in consultants were compared with the numbers expected on the basis of rates in England and Wales by calculating age, sex, and calendar year standardised mortality ratios (SMRs).[21] For analyses, death rates in male consultants were compared with age specific death rates of all men in social class I for the years around the 1961, 1971, and 1981 censuses. Social class specific rates were not available for women in the general population. Secondly, mortality rates in each specialty were compared with those of all consultants, through rate ratios (RRs) adjusted for age, sex, and calendar year by indirect standardisation.

Causes of death in consultants may be more thoroughly investigated than those in the general population. This may introduce bias, particularly for deaths at older ages when attribution of cause becomes increasingly difficult. To reduce the effect of this bias, calculation of SMRs was confined to deaths and person-years at ages 25 to 74 years. As RRs did not involve comparisons with death rates in the general population, they were calculated from deaths at all ages.

All analyses were performed with the Office of Population Censuses and Surveys' mortality analysis system and stage III computer packages.[22] Tests of statistical significance and confidence intervals (95% CIs) were based on the normal approximation except when the number of observed deaths was < 20, when they were derived directly from the Poisson distribution.[23] All P values are two sided and results were deemed significant when $P<0.05$.

Results

Records for 20 992 consultants were supplied to the Office of Population, Censuses and Surveys, of which 403 (2%) were excluded because they could not be traced in the NHS central register and 63 (<1%) because an emigration had been recorded in the register before the date of entry to the study (table 1). In the final study population of 20 526 consultants, 11% (2168) were women, 24% (4911) were born before 1915, and 16% (3340) had become NHS consultants during 1948 or 1949. A total of 427 770 person-years of observation were accumulated, with an average of 20.8 years per consultant; 21.5% of person-years were at ages < 45 years, 56.9% at ages 45 to 64, and 21.6% at ages ≥65. Over the period of the study, 4335 of the consultants were known to have died and 740 emigrated; the remaining 15 451 were presumed to be alive on 30 June 1992.

Among male consultants, the largest specialty was general medicine (16%), then general surgery (12%), anaesthetics (11%), psychiatry (11%), and pathology (10%).

Table 2 SMRs and number of deaths observed (Obs) for major cause of death groups at ages 25-74 in NHS consultants, 1962-92

Cause of death (ICD-9)	Men			Women			All consultants		
	Obs	SMR†	(95% CI)	Obs	SMR†	(95% CI)	Obs	SMR†	(95% CI)
Infectious and parasitic diseases (1-139)	13	40***	(21 to 68)	0	0	(0 to 207)	13	38***	(20 to 65)
Malignant neoplasms (140-208, 238, 289.8)	730	45***	(42 to 49)	84	71***	(56 to 88)	814	47***	(44 to 50)
Endocrine, nutritional and metabolic diseases, and immunity disorders (240-279)	20	35***	(22 to 55)	1	18	(1 to 102)	21	34***	(21 to 52)
Diabetes mellitus (250)	7	16***	(6 to 33)	0	0*	(0 to 93)	7	14***	(6 to 29)
Diseases of the blood and blood forming organs (280-289)	8	102	(44 to 201)	0	0	(0 to 441)	8	92	(40 to 181)
Mental disorders (290-319)	11	61	(31 to 110)	2	119	(15 to 432)	13	66	(35 to 113)
Diseases of the nervous system and sense organs (320-389)	60	92	(70 to 118)	3	54	(11 to 157)	63	89	(68 to 114)
Diseases of the circulatory system (390-459)	1356	49***	(47 to 52)	46	37***	(27 to 50)	1402	49***	(46 to 51)
Ischaemic heart disease (410-414)	935	48***	(45 to 51)	20	30***	(19 to 47)	955	48***	(45 to 51)
Cerebrovascular disease (430-438)	222	51***	(45 to 59)	19	58*	(35 to 90)	241	52***	(46 to 59)
Other circulatory system (390-409, 415-429, 439-459)	199	51***	(44 to 59)	7	28***	(11 to 58)	206	50***	(44 to 57)
Diseases of the respiratory system (460-519)	128	22***	(18 to 26)	8	32***	(14 to 64)	136	23***	(19 to 27)
Diseases of the digestive system (520-579)	75	53***	(42 to 67)	3	30*	(6 to 86)	78	52***	(41 to 65)
Chronic liver disease and cirrhosis (571)	36	106	(75 to 147)	2	73	(9 to 265)	38	104	(74 to 143)
Diseases of the genitourinary system (580-629)	23	44***	(28 to 66)	0	0	(0 to 100)	23	41***	(26 to 61)
Diseases of the musculoskeletal system and connective tissue (710-739)	9	63	(29 to 119)	0	0	(0 to 150)	9	54	(25 to 103)
Symptoms, signs, and ill-defined causes (780-799)	4	81	(22 to 207)	1	350	(9 to 1952)	5	94	(31 to 220)
Injury and poisoning (800-999)	149	78**	(66 to 92)	20	179*	(110 to 277)	169	84*	(72 to 98)
Accidental poisoning (850-869, 929.2)	18	227**	(135 to 359)	1	134	(3 to 747)	19	221*	(133 to 345)
Suicide and self inflicted injury (950-959)	56	96	(72 to 125)	8	215	(93 to 423)	64	103	(79 to 132)
Open verdict (980-989)	15	96	(54 to 159)	1	74	(2 to 412)	16	94	(54 to 153)
All causes	2627	47***	(46 to 49)	171	55***	(47 to 63)	2798‡	48***	(46 to 49)

* P < 0.05; ** P < 0.01; *** P < 0.001.
† England and Wales as standard, adjusted for age, calender year of death, and sex (where appropriate).
‡ Includes 14 deaths from causes not separately listed and 30 deaths for which cause of death information was not available.

Women were concentrated in a few specialties: anaesthetics (26%), psychiatry (19%), pathology (12%), and general medicine (10%) (see appendix).

MORTALITY IN ALL CONSULTANTS COMBINED

Overall death rates in all consultants combined were about half those in the general population of England and Wales (table 2), the SMR for women (55) being slightly higher than that for men (47). When calculated separately for each calendar period of follow up (1962-, 1965-, 1970-,..., 1990-92) SMRs for all causes of death combined showed no evidence of an increase or decrease in death rates relative to national rates (z test for trend = 1.39 for men and z=0.75 for women). Mortality in both sexes combined was significantly lower than national rates for infectious and parasitic diseases, malignant neoplasms, endocrine, nutritional, and metabolic diseases (including diabetes), diseases of the circulatory, respiratory, digestive, and genitourinary systems, and injury and poisoning (table 2). In contrast with the significantly reduced death rate from digestive diseases, mortality from cirrhosis was similar to that expected on the basis of national rates (SMR 104). Although death rates from injury and poisoning among male consultants were significantly lower than those of all men in England and Wales, a twofold significant excess of death from accidental poisoning was observed (SMR 227, 95% CI 135 to 359); half of these deaths involved the use of barbiturates (table 3). Death rates from injury and poisoning in female consultants were almost 80% higher than those of all women (SMR 179, 95% CI 110 to 277) and this was largely explained by an excess of suicide (SMR 215, 95% CI 93 to 423), again mainly from prescription drugs.

None of the specific cancer sites examined showed significantly raised death rates when compared with national rates, although significantly reduced rates were observed for several sites (table 4). Among men, the lowest SMR was for lung cancer (SMR 22, 95% CI 19 to 26). Among women, rates from lung cancer were also significantly low (SMR 53). No deaths were observed from cancer of the cervix compared with 5.3 expected on the basis of national rates (P=0.01), whereas the number of

Table 3 Method of death from accidental poisoning, suicide, and self inflicted injury, and open verdict in NHS consultants aged 25-74, 1962-92

Cause of death	Number of deaths	
	Men	Women
Accidental poisoning	18	1
Barbiturates	9	—
Benzodiazepines	—	1
Drugs acting on the central nervous system	2	—
Tranquillisers	1	—
Other drugs	3	—
Nitrogen oxides	1	—
Motor vehicle exhaust gas	1	—
Other gases	1	—
Suicide and self inflicted injury	56	8
Analgesics, antipyretics, and antirheumatics	4	1
Barbiturates	1	3
Tranquillisers	4	—
Other specified drugs	2	—
Unspecified solids or liquids	21	3
Carbon monoxide	—	1
Other unspecified gases	2	—
Hanging, strangulation, and suffocation	10	—
Cutting and piercing instruments	6	—
Submersion	2	—
Firearms	2	—
Other means	2	—
Open verdict	15	1
Analgesics, antipyretics, and antirheumatics	1	—
Other sedatives and hypnotics	1	—
Tranquillisers	1	1
Other and unspecified solids or liquids	7	—
Cutting and piercing instruments	2	—
Submersion	1	—
Other means	2	—

Table 4 SMRs and number of deaths observed (Obs) for specific cancers at ages 25-74 in NHS consultants, 1962-92

	Men			*Women*			*All consultants*		
Cause of death (ICD-9)	*Obs*	*SMR†*	*(95% CI)*	*Obs*	*SMR†*	*(95% CI)*	*Obs*	*SMR†*	*(95% CI)*
Malignant neoplasms (140-208, 238, 289.8)	730	45***	(42 to 49)	84	71***	(56 to 88)	814	47***	(44 to 50)
Mouth and pharynx (143-149)	9	55	(25 to 104)	1	118	(3 to 657)	10	58	(28 to 107)
Oesophagus (150)	32	58***	(40 to 82)	0	0	(0 to 147)	32	55***	(37 to 78)
Stomach (151)	39	26***	(18 to 35)	1	17*	(0 to 96)	40	25***	(18 to 35)
Colon (153)	68	68**	(53 to 87)	12	132	(68 to 231)	80	74**	(58 to 92)
Rectum (154)	32	45***	(31 to 64)	4	99	(27 to 253)	36	48***	(34 to 66)
Liver and gall bladder (155.0, 155.1, 156)	17	80	(46 to 128)	1	63	(2 to 349)	18	79	(47 to 125)
Pancreas (157)	56	80	(60 to 103)	5	109	(35 to 254)	61	81	(62 to 104)
Larynx (161)	5	32**	(10 to 74)	0	0	(0 to 1049)	5	31**	(10 to 72)
Lung (162)	147	22***	(19 to 26)	10	53***	(25 to 97)	157	23***	(20 to 27)
Bone and articular cartilage (170)	4	103	(28 to 265)	0	0	(0 to 1727)	4	98	(27 to 250)
Melanoma of skin (172)	8	84	(36 to 165)	3	269	(56 to 786)	11	103	(51 to 184)
Breast (174, 175)	2	104	(13 to 376)	29	99	(66 to 142)	31	100	(68 to 141)
Cervix uteri (180)	—	—		0	0**	(0 to 70)	0	0**	(0 to 70)
Ovary (183)	—	—		8	83	(36 to 165)	8	83	(36 to 165)
Prostate (185)	83	102	(82 to 127)	—	—		83	102	(82 to 127)
Testis (186)	2	66	(8 to 240)	—	—		2	66	(8 to 240)
Bladder (188)	27	46***	(31 to 67)	0	0	(0 to 213)	27	45***	(30 to 65)
Kidney, except pelvis (189.0)	23	77	(49 to 115)	1	70	(2 to 392)	24	76	(49 to 113)
Brain and other central nervous system (191, 192, 225, 239.6)	38	79	(51 to 109)	1	28	(1 to 156)	39	76	(54 to 104)
Thyroid gland (193)	3	109	(23 to 320)	0	0	(0 to 870)	3	97	(20 to 283)
Ill defined and secondary (155.2, 195-199)	32	41***	(28 to 58)	0	0**	(0 to 58)	32	38***	(27 to 54)
Non-Hodgkin's lymphoma (200, 202)	37	120	(84 to 165)	1	45	(1 to 253)	38	115	(85 to 158)
Hodgkin's disease (201)	5	58	(19 to 134)	1	223	(6 to 1244)	6	66	(24 to 144)
Multiple myeloma (203)	15	78	(44 to 128)	0	0	(0 to 254)	15	72	(40 to 119)
Leukaemia (204-208, 238.4)	33	90	(62 to 127)	2	80	(10 to 288)	35	90	(62 to 124)

* $P < 0.05$; ** $P < 0.01$; *** $P < 0.001$.
† England and Wales as standard, adjusted for age, calender year of death, and sex (where appropriate).

breast cancer deaths observed in women was close to expectation (SMR 99).

When rates in male consultants were compared with those of all men in social class I (results not shown), with the exception of injury and poisoning, all SMRs remained significantly below 100. When social class I men were used as the standard for comparison the SMR for all causes increased to 57 (95% CI 55 to 59). Standardised mortality ratios also increased for all cancers combined (SMR 58, 95% CI 54 to 63), lung cancer (SMR 39, 95% CI 33 to 46), and respiratory diseases (SMR 43, 95% CI 36 to 51), whereas those for ischaemic heart disease and cerebrovascular disease were relatively unaffected (SMRs 52 and 58, respectively). The SMR for injury and poisoning was 91 (95% CI 77 to 107) and for suicide it was 88 (95% CI 67 to 114).

MORTALITY IN DIFFERENT SPECIALTIES

Relative to all consultants, psychiatrists had significantly raised rates for all causes of death combined (RR 1.12), ischaemic heart disease (RR 1.18), and injury and poisoning (RR 1.46) (table 5). A highly significant excess of deaths from respiratory disease was found in radiologists and radiotherapists (RR 1.68, P = 0.004); 16 of these deaths were from pneumonia (all of which occurred at ages ≥70), 10 were from bronchitis, six from chronic obstructive airways disease, four from emphysema, and one from idiopathic fibrosing alveolitis. General surgeons had significantly reduced rates of injury and poisoning (RR 0.56), as did consultants working in dental specialties (RR 0.27). There were no other specialties with significantly raised or reduced rates for the causes listed in table 5.

Fourteen of the 35 deaths from injury and poisoning among psychiatrists were attributed to suicide (RR 1.56, 95% CI 0.92 to 2.63). General surgeons were the only specialty with a death rate from suicide significantly different from that of all consultants (RR 0.22, 95% CI 0.03 to 0.80).

Half of the 20 deaths responsible for the raised mortality from injury and poisoning in female consultants were in anaesthetists. This was three times the number expected from general population rates (SMR 348, 95% CI 167 to 640). Four of the deaths in female anaesthetists were attributed to suicide (SMR 405, 95% CI 110 to 1037). Among men, death rates from accidental poisoning were above national rates for several specialties, but only for obstetricians and gynaecologists was the excess significant (SMR 934, 95% CI 254 to 2391, based on four deaths).

Significantly raised RRs were found for colon cancer in psychiatrists (RR 1.67, 95% CI 1.09 to 2.56) and ear, nose, and throat surgeons (RR 2.25, 95% CI 1.03 to 4.27), melanoma in anaesthetists (RR 3.33, 95% CI 1.22 to 7.25), bladder cancer in general surgeons (RR 2.40, 95% CI 1.24 to 4.19), and laryngeal cancer in ophthalmologists (RR 7.63, 95% CI 1.57 to 22.29). The only significant deficit was from prostatic cancer in anaesthetists (RR 0.48, 95% CI 0.19 to 0.98).

Death rates from infectious and parasitic diseases, diseases of the nervous system, cerebrovascular disease, and digestive disease were also examined according to specialty (results not shown). None of the specialties had significantly raised death rates from any of these causes of death; the only significant deficit was for digestive disease in psychiatrists (RR 0.36, P=0.03).

When death rates were examined separately for cirrhosis, a significant twofold excess was found for anaesthetists (table 6). All 10 of the

Table 5 RRs for major causes of death and numbers of deaths observed (Obs) in NHS consultants, by specialty: deaths at all ages, 1962-92

	Cause of death (ICD-9)														
	All causes (000-999)			Malignant neoplasms (140-208, 238.4, 289.8)			Ischaemic heart disease (410-414)			Diseases of respiratory system (460-519)			Injury and poisoning (800-999)		
Specialty (consultants (n))	Obs	RR†	(95% CI)	Obs	RR†	(95% CI)	Obs	RR†	(95% CI)	Obs	RR†	(95% CI)	Obs	RR†	(95% CI)
General medicine (3181)	641	0.95	(0.88 to 1.03)	169	0.97	(0.83 to 1.13)	191	0.88	(0.76 to 1.01)	46	0.97	(0.73 to 1.30)	35	1.08	(0.78 to 1.50)
Anaesthetics (2633)	459	1.02	(0.93 to 1.12)	109	0.88	(0.73 to 1.06)	147	1.09	(0.93 to 1.28)	37	1.21	(0.88 to 1.67)	34	1.32	(0.94 to 1.85)
Psychiatry (2474)	498	1.12*	(1.03 to 1.22)	122	1.00	(0.84 to 1.19)	162	1.18*	(1.01 to 1.38)	33	1.14	(0.81 to 1.60)	35	1.46*	(1.05 to 2.03)
General surgery (2181)	525	0.92	(0.85 to 1.00)	146	1.02	(0.87 to 1.20)	173	0.93	(0.80 to 1.08)	33	0.78	(0.56 to 1.10)	14	0.56*	(0.31 to 0.94)
Pathology (2095)	402	1.02	(0.93 to 1.13)	104	0.97	(0.80 to 1.17)	128	1.04	(0.87 to 1.23)	27	1.07	(0.73 to 1.56)	21	1.00	(0.65 to 1.53)
Radiology and radiotherapy (1589)	324	1.03	(0.92 to 1.15)	82	0.99	(0.80 to 1.23)	100	1.00	(0.82 to 1.22)	37	1.68**	(1.22 to 2.32)	16	1.01	(0.58 to 1.64)
Obstetrics and gynaecology (1141)	248	1.02	(0.90 to 1.16)	76	1.16	(0.93 to 1.45)	68	0.91	(0.72 to 1.15)	14	0.83	(0.45 to 1.39)	10	0.84	(0.40 to 1.54)
Traumatic and orthopaedic surgery (1118)	232	1.07	(0.94 to 1.22)	58	1.02	(0.79 to 1.32)	81	1.15	(0.93 to 1.43)	12	0.85	(0.44 to 1.48)	11	0.95	(0.47 to 1.70)
Ophthalmology (732)	192	1.02	(0.89 to 1.18)	54	1.16	(0.89 to 1.52)	57	0.95	(0.73 to 1.23)	12	0.82	(0.42 to 1.43)	5	0.62	(0.20 to 1.45)
Dental specialties (722)	149	1.00	(0.85 to 1.17)	35	0.92	(0.66 to 1.28)	51	1.05	(0.80 to 1.38)	13	1.29	(0.69 to 2.21)	2	0.27*	(0.03 to 0.98)
Paediatrics (691)	109	0.95	(0.79 to 1.15)	30	0.94	(0.66 to 1.34)	34	0.97	(0.69 to 1.36)	5	0.66	(0.21 to 1.54)	5	0.79	(0.26 to 1.84)
Ear, nose, and throat surgery (642)	167	0.93	(0.80 to 1.08)	44	1.01	(0.75 to 1.36)	51	0.89	(0.68 to 1.17)	11	0.77	(0.38 to 1.38)	4	0.53	(0.14 to 1.36)
Chest diseases (576)	217	1.05	(0.92 to 1.20)	62	1.19	(0.93 to 1.53)	72	1.08	(0.86 to 1.36)	12	0.78	(0.40 to 1.36)	13	1.63	(0.87 to 2.79)
Neurological diseases (395)	60	0.80	(0.62 to 1.03)	20	1.01	(0.62 to 1.56)	17	0.71	(0.41 to 1.14)	3	0.61	(0.13 to 1.78)	3	0.73	(0.15 to 2.13)
Genitourinary medicine (221)	68	1.20	(0.95 to 1.52)	14	0.95	(0.52 to 1.59)	24	1.32	(0.89 to 1.97)	4	0.98	(0.27 to 2.51)	2	0.83	(0.10 to 3.00)
Infectious diseases (75)	36	1.13	(0.82 to 1.57)	9	1.22	(0.56 to 2.32)	13	1.27	(0.68 to 2.17)	2	0.74	(0.09 to 2.67)	2	2.22	(0.27 to 8.02)
Other (125)	8	0.73	(0.32 to 1.44)	2	0.65	(0.08 to 2.35)	1	0.29	(0.07 to 1.62)	1	2.00	(0.05 to 11.14)	1	2.00	(0.05 to 11.14)
Total	4335‡	1.00		1136	1.00		1370	1.00		302	1.00		213	1.00	

* P < 0.05; ** P < 0.01.
† Relative to that of all consultants, adjusted for age, sex, and calendar year of death.
‡ Includes 33 deaths for which cause of death information was not available.

Table 6 RRs and numbers of deaths observed (Obs) for cirrhosis at all ages in NHS consultants by specialty, 1962-92

Specialty	Obs	RR†	(95% CI)
General medicine	4	0.63	(0.17 to 1.61)
Anaesthetics	10	2.22*	(1.06 to 4.08)
Psychiatry	1	0.20	(0.01 to 1.11)
General surgery	2	0.41	(0.05 to 1.48)
Pathology	5	1.14	(0.37 to 2.66)
Radiology and radiotherapy	4	1.25	(0.34 to 3.20)
Obstetrics and gynaecology	2	0.83	(0.10 to 3.00)
Traumatic and orthopaedic surgery	3	1.43	(0.29 to 4.18)
Ophthalmology	3	2.14	(0.44 to 6.25)
Dental specialties	0	0.00	(0.00 to 2.46)
Paediatrics	0	0.00	(0.00 to 3.07)
Ear, nose, and throat surgery	1	0.67	(0.02 to 3.73)
Chest diseases	3	1.67	(0.34 to 4.88)
Neurological diseases	1	1.67	(0.04 to 9.31)
Genitourinary medicine	2	5.00	(0.61 to 18.06)
Infectious diseases	1	10.00	(0.25 to 55.72)
Other	0	0.00	(0.00 to 29.19)

* P < 0.05.
† Relative to that of all consultants, adjusted for age, sex, and calendar year of death.

deaths contributing to this finding were in male anaesthetists. Death certificates for four of these stated alcohol as the cause, one was attributed to chronic hepatitis and the remaining five simply to cirrhosis.

Discussion

Overall death rates in this cohort of NHS consultants were around half those expected on the basis of national rates. It is well known that working populations experience lower overall mortality than the general population, with those in higher social class occupations having the greatest advantage.[24] As well as selection of healthy people into the profession, beneficial health related behaviours of doctors—particularly their lower rates of smoking[25]—are likely to have made a major contribution to the low mortality found for cardiovascular disease, lung cancer, and other diseases related to smoking. NHS consultants did not experience overall raised death rates from cirrhosis, which contrasts with excesses found for medical doctors in recent national statistics as well as in the past.[1 26] The cohort was constructed from computerised staff records which were assembled on an annual basis by the NHS for the purpose of monitoring medical manpower and is therefore likely to be complete.

The finding that death rates in male consultants were also lower than those of men in social class I contrasts with a study in Finland which found mortality of male doctors to be at least as high as those of other professional men.[2] One explanation for this difference may be that the present study was confined to hospital consultants, a successful survivor population of those attaining the most senior posts. It also excludes general practitioners, who have been found to have higher death rates than other doctors.[17] A further factor to consider, however, is whether death rates in the present study are biased as a

result of some deaths being missed. Almost 98% of the cohort was successfully traced and all deaths in traced consultants that occurred in this country should have been recorded in the NHS central register. Emigrations were notified for 4% of consultants. Although it is possible that some emigrations were not notified, this is unlikely to explain more than a small part of the low death rates found.

Few previous studies have included data on women doctors and the findings for female consultants, which made up 10% of the cohort, are therefore of particular interest. Their death rates were significantly lower than those of women in the general population for several causes of death, including diseases of the circulatory, respiratory, and digestive systems. Mortality from all malignant neoplasms was reduced, and significant deficits were found for several specific cancers for which rates in higher social classes are known to be low, including stomach, lung, and cervix.[27] Death rates from breast cancer, by contrast, were similar to those of women in the general population, despite the raised rates usually found in higher social classes; this pattern was perhaps counterbalanced in female consultants by earlier presentation, or better treatment, or both.

The main exception to the low mortality among female consultants was the almost twofold excess death rate from injury and poisoning. This was largely attributable to an excess of suicide, especially in female anaesthetists. A similar excess was not apparent in men, but rates of accidental poisoning were significantly raised, particularly in male obstetricians and gynaecologists. Most accidental poisonings involved prescription drugs. It seems implausible that consultants would be more likely than the general population to take a fatal overdose inadvertently. It seems probable that these deaths were in fact suicides that certifying doctors were unwilling to designate as such on their colleagues' death certificates. It is curious that this does not seem to have occurred, however, for deaths in female consultants. Medical practitioners have been found to be at increased risk of death from suicide and related causes in national statistics covering several decades.[1 26] High levels of stress, anxiety, and depression have been documented in NHS consultants.[28] Adverse working conditions—such as long hours and excessive workloads, and the consequent strain this places on their personal lives, may be important. Effective preventive measures are clearly needed.

Doctors may be exposed to specific hazards, including biological and infective agents, anaesthetic gases, toxic chemicals, and ionising radiation.[6] Those working in certain specialties are more likely to be exposed than others and several of these have been the subject of previous epidemiological investigations, including anaesthetists,[15 16] dentists,[14] pathologists,[11 12] psychiatrists,[13] and radiologists.[8 12] The present study permitted the examination of death rates across a wide range of other specialties. A similar general approach was used by Doll and Peto, who described mortality in a large cohort of British doctors in relation to their specialty and smoking habits.[17] Doctors included in that study were identified from the 1952 medical directory, were born before 1915, replied to a questionnaire on their smoking habits, over 50% were general practitioners, and all were men. Overlap with the current cohort is likely to be small because only 24% of our cohort were born before 1915 and inclusion was not dependent on response to a questionnaire.

Occupational exposure to inhaled anaesthetics has been associated in certain studies with increased risks of certain specific cancers,[17 29] hepatic and renal diseases,[9 10] infections,[30] and adverse reproductive outcomes,[10 31] although evidence for these associations is inconclusive.[32 33] Cancer death rates in anaesthetists in the present study were, if anything, lower than those of all consultants and no excesses were found for lymphoma or cancer of the pancreas—two specific cancers which have previously been linked with occupational exposure to inhaled anaesthetics.[17 29] Anaesthetists had significantly raised death rates from melanoma, and significantly decreased rates of prostatic cancer. These were unexpected findings and may be due to chance.

Anaesthetists had a significant twofold excess of death from cirrhosis compared with all consultants. The evidence for an association between exposure to anaesthetic gases and liver disease is not strong but previous studies have not specifically looked at cirrhosis.[9 10 15 31] Over half of the deaths from cirrhosis made no mention of alcohol. The lack of data on alcohol consumption for the present study makes these findings difficult to interpret, but the excess of cirrhosis may warrant further investigation.

Pathologists are exposed to a range of laboratory hazards, several of which are known or suspected carcinogens, including certain organic solvents and formaldehyde.[34] Recent studies have reported increased risks of brain cancer in pathologists, although no specific aetiological factors have been identified.[11] The present study provides no evidence of an excess of cancer of the brain or of cancer overall in pathologists.

Increased risks of leukaemia, and certain other cancers, have been well documented in British and American radiologists working during the early part of this century.[8 12 35 36] The lower risks found in later cohorts—including ours—are likely to reflect the large reductions which have occurred in occupational exposure to radiation over time. Radiologists and radiotherapists included in the present study had death rates from all cancer combined which were close to those for all consultants. Above average death rates were observed for several specific cancers (stomach, kidney, non-Hodgkin's lymphoma, multiple myeloma) but none were significant. A significant excess of deaths from respiratory diseases found in this specialty could be related to smoking, although there was no suggestion of an excess from other diseases related to smoking, and there is no evidence to suggest that radiologists have smoked more than other specialists in the past.[17] We cannot, however, rule out the

possibility that some of these deaths were undiagnosed respiratory cancers.

Psychiatrists had significantly higher overall death rates compared with all consultants, with significantly raised rates of ischaemic heart disease, injury and poisoning, and colon cancer. There have been previous reports of increased rates of suicide among psychiatrists but few studies have directly compared their death rates with those of other medical specialties.[13 17] Possible explanations for the increased risks of injury and poisoning, and other causes, found here are unclear but could reflect the selection of people at increased risk of these diseases into the specialty or differences in health related behaviours between psychiatrists and other specialties. The limited amount of available evidence does not suggest that psychiatrists smoke more than other medical practitioners,[17] but there is little information currently available on other relevant risk factors.

There was no evidence in the cohort of increased mortality from infectious diseases or from chronic diseases hypothesised as being due to infection—such as certain neurological diseases and malignancies. The specialties found to be at greatest risk of death from leukaemia—ophthalmologists, ear, nose, and throat surgeons, paediatricians, and chest disease specialists—are ones that could plausibly be argued to be particularly exposed to respiratory infections. In no instance, however, were these excesses significant and these specialties are not the only ones with high exposure to respiratory disease.

The present study investigated mortality in several specialties that have not been the subject of previous study. With few exceptions, there was little evidence to suggest that any of these specialties experienced higher or lower death rates than those of all consultants. Significantly increased death rates were observed for cancer of the colon in ear, nose, and throat surgeons, cancer of the larynx in ophthalmologists, and bladder cancer in general surgeons. We can see no obvious explanation for these findings other than chance.

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Appendix: Grouping of 51 individual specialty codes used in analysis

Specialty group (number in study cohort)	*Individual specialties*
General medicine (2975 men, 206 women)	General medicine, dermatology, cardiology, orthopaedics and physical medicine, clinical pharmacology, geriatrics, nephrology, rheumatology, clinical physiology, endocrinology, clinical genetics, gastroenterology
Anaesthetics (2073 men, 560 women)	Anaesthetics
Psychiatry (2057 men, 417 women)	Mental handicap, mental illness, child and adolescent psychiatry, forensic psychiatry, psychotherapy
General surgery (2150 men, 31 women)	General surgery, paediatric surgery, urology, plastic surgery, cardiothoracic surgery
Pathology (1769 men, 261 women)	General pathology, chemical pathology, haematology, histopathology, clinical microbiology, neuropathology, immunopathology, blood transfusion
Radiology and radiotherapy (1400 men, 189 women)	Nuclear medicine, radiotherapy, radiology
Obstetrics and gynaecology (978 men, 163 women)	Obstetrics and gynaecology
Traumatic and orthopaedic surgery (1094 men, 24 women)	Traumatic and orthopaedic surgery, accident and emergency and casualty surgery
Ophthalmology (690 men, 42 women)	Ophthalmology
Dental specialties (700 men, 22 women)	Dental surgery, orthodontics, restorative dentistry
Paediatrics (577 men, 114 women)	Paediatrics
Ear, nose, and throat surgery (616 men, 26 women)	Ear, nose, and throat surgery
Chest diseases (532 men, 44 women)	Diseases of the chest
Neurological diseases (373 men, 22 women)	Neurology, clinical neurological physiology, neurosurgery
Genitourinary medicine (194 men, 27 women)	Genitourinary medicine
Infectious diseases (72 men, 3 women)	Infectious diseases
Other (108 men, 17 women)	Epidemiology, miscellaneous (occupational health, genetics, community medicine, forensic medicine, social medicine)

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